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Monitoring Centre. Tel : 2681 6277



香港體育學院有限公司  
Hong Kong Sports Institute Limited

香港新界沙田源禾路25號 香港體育學院  
Hong Kong Sports Institute, 25 Yuen Wo Road,  
Sha Tin, N.T. Hong Kong

電話 Tel : (852) 2681 6888 圖文傳真 Fax : (852) 2681 6330  
網址 Website : <http://www.hksi.org.hk>

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## 運動營養教育系列手冊 SPORT NUTRITION EDUCATION SERIES XIV

### 運動員的營養補充品 Nutritional Supplements for Athletes

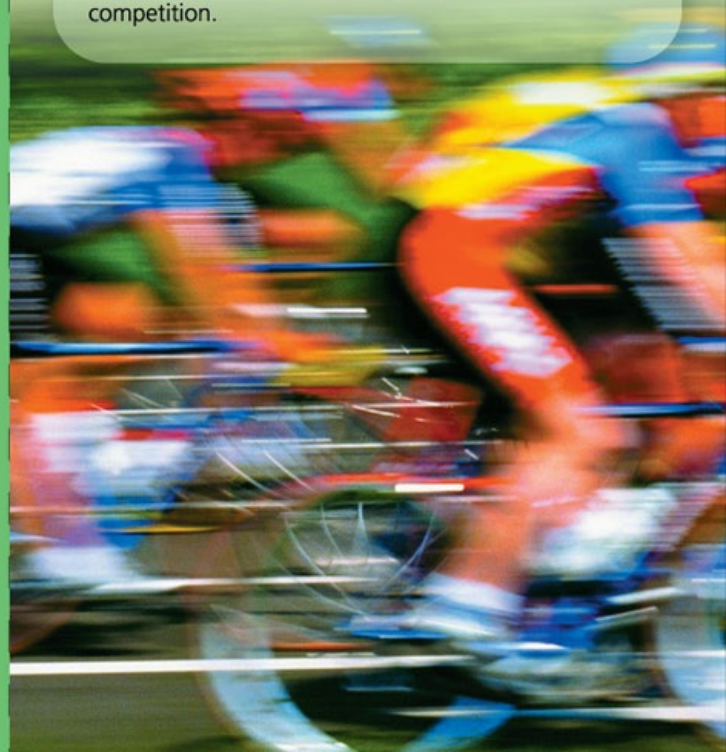


## 運動員的營養補充品

運動員如果有一個營養豐富及熱量充足的飲食，其實並不需額外服用補充品。但是這些補充品在某情況下是很有用的，它能幫助運動員達到能量要求，維持能量去應付練習或補充肌糖使運動後盡快復原。營養補充品如：均衡營養飲品、能量棒、糖漿、運動飲品和肌酸能提供“簡便的補充”，給一些生活繁忙和需要高能量要求的運動員進食。它們容易攜帶，適合要到海外比賽的運動員使用。

## Nutritional Supplements for Athletes

Athletes who have nutritionally and energy balanced diets may not need to take extra supplements. However, some supplements are useful in certain situations. They may help the athletes to achieve energy requirement, maintain energy level during exercise or replenish muscle glycogen quickly after exercise. Supplements like balanced nutrition drinks, energy bars, carbohydrate gels, sports drinks and creatine provide "convenient supplementation" to athletes with busy schedules and high energy demands. These products are also portable and may be taken with the traveling athletes to overseas competition.



# 營養補充品

## 均衡營養飲品

### 概要

- 成份：液體或粉狀飲品，都是含高能量、高碳水化合物，適量蛋白質及低脂肪
- 提供濃縮營養和容易準備的代餐或能量補充品
- 提供多種的維他命，礦物質和必須的氨基酸  
例如：大概每日要飲1至1.5公升代餐飲品才能達到大部分營養素的每日需要
- 需要跟隨指引才達到能量和營養的需求
- 要知道產品是否包含乳糖，請檢查食物標籤內容
- 提供多款口味

### 簡介

- 濃縮的能量配方，提供份量均衡的營養素和微量元素。對於一些需要增加能量的運動員是非常有用。
  - ◆ 需要增加瘦組織或體重的運動員
  - ◆ 需大量訓練而又很難吃得足夠的運動員
  - ◆ 正處於成長期的運動員
- 提供符合建議量的碳水化合物，蛋白質，脂肪和其他微量元素
  - ◆ 作為運動後的身體復原飲品
- 其容量低，有助減低腸胃的食糜及控制體重
  - ◆ 適合於比賽時會腸胃不適的運動員作為賽前飲品，但建議在賽前嘗試及習慣使用此產品
- 方便攜帶，不容易變壞和容易準備
  - ◆ 適合需要到物資不足、難找食物補充或食物衛生受到質疑的國家時使用

# Nutritional Supplements

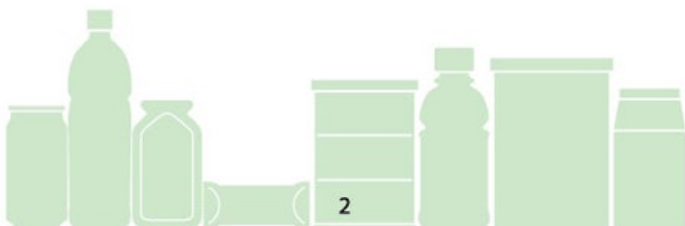
## Balanced Nutrition Drinks

### Overview

- Composition: conforms to healthy eating guidelines, rich in energy and carbohydrate, moderate protein, low to moderate fat, in powder or liquid form.
- Provides a nutritionally compact and easily prepared meal replacement or energy supplement.
- Provides a variety of vitamins, minerals and essential amino acids, e.g. daily requirement for most nutrients are met in about 1 to 1.5L.
- Needs to be used according to directions to ensure that energy and nutrient composition are adequate for achieving specific nutritional goals.
- Check product information on whether the product is lactose free.
- Comes in a variety of flavors.

### Profile

- Energy dense formula, supplying a balance of macronutrients and micronutrients. Useful for athletes who need to increase energy intake.
  - ◆ Athletes aiming to increase lean body mass or body weight.
  - ◆ Athletes coping with heavy training loads and have difficulty eating enough.
  - ◆ Athletes undergoing growth spurts.
- Provides carbohydrate, protein, fat and other micronutrients in recommended amounts for healthy eating.
  - ◆ Useful as post-exercise recovery drink.
- Provides low bulk, useful in reducing gastrointestinal contents and controlling body weight.
  - ◆ Useful as pre-event meal for athletes with high risk of gastrointestinal problem during exercise, however, it is recommended that the athlete is familiar with using this product before the event.
- Portable, non-perishable and easily prepared.
  - ◆ Useful for travel to countries with inadequate or hard to access food supply, or problems with food hygiene.



## 營養分析 (常用沖調法)

	倍力加	加營養素
份量	240毫升	240毫升
能量 (千卡)	240	250
碳水化合物 (克)	33	40
蛋白質 (克)	9	9
脂肪 (克)	8	6
水份 (克)	-	200
維他命A (I.U)	800	1250
維他命D (I.U)	64	100
維他命E (I.U)	4.8	7.5
維他命K (微克)	16	20
維他命C (毫克)	32	30
葉酸 (微克)	64	100
維他命B1 (毫克)	0.24	0.38
維他命B2 (毫克)	0.29	0.43
維他命B6 (毫克)	0.35	0.5
維他命B12 (微克)	0.9	1.5
煙酸 (毫克)	3.2	5
泛酸 (毫克)	1.6	2.5
生物素 (微克)	48	75
膽鹼 (毫克)	64	83
鈉 (毫克)	176	200
鉀 (毫克)	300	370
氯化物 (毫克)	272	310
鈣 (毫克)	160	300
磷 (毫克)	160	250
鎂 (毫克)	64	100
鐵 (毫克)	2.9	4.5
鋅 (毫克)	2.4	3.8
錳 (毫克)	0.4	1.2
銅 (毫克)	0.32	0.5
碘 (微克)	24	38
硒 (微克)	-	18
鉻 (微克)	-	30
鉬 (微克)	-	38

## Nutritional Analysis (Typical Dilution)

	Enercal Plus	Ensure
Serving Size	240 ml	240 ml
Energy (kcal)	240	250
Carbohydrate (g)	33	40
Protein (g)	9	9
Fat (g)	8	6
Water (g)	-	200
Vitamin A (I.U)	800	1250
Vitamin D (I.U)	64	100
Vitamin E (I.U)	4.8	7.5
Vitamin K (μg)	16	20
Vitamin C (mg)	32	30
Folic acid (μg)	64	100
Vitamin B1 (mg)	0.24	0.38
Vitamin B2 (mg)	0.29	0.43
Vitamin B6 (mg)	0.35	0.5
Vitamin B12 (μg)	0.9	1.5
Niacin (mg)	3.2	5
Pantothenic acid (mg)	1.6	2.5
Biotin (μg)	48	75
Choline (mg)	64	83
Sodium (mg)	176	200
Potassium (mg)	300	370
Chloride (mg)	272	310
Calcium (mg)	160	300
Phosphorus (mg)	160	250
Magnesium (mg)	64	100
Iron (mg)	2.9	4.5
Zinc (mg)	2.4	3.8
Manganese (mg)	0.4	1.2
Copper (mg)	0.32	0.5
Iodine (μg)	24	38
Selenium (μg)	-	18
Chromium (μg)	-	30
Molybdenum (μg)	-	38

## 使用時注意事項

- 使用代餐飲品作為正餐，正常來說是不會令體重增加。運動員若想增加瘦組織或體重可在餐與餐之間使用這產品
- 濃縮的配方可能令人吸收過份的能量，令某些運動員增加不必要的體重
- 如沒按照指示調校，不能達到預料的能量和營養要求。調校得太濃又可能引致腸胃不適
- 腸胃不佳和不能接受乳糖的運動員應進食不含乳糖的產品
- 食用前留意產品有效日期

**產品示例：**倍力加，加營養

## 能量棒

### 概要

- 成份：含豐富的能量、碳水化合物和蛋白質
- 一般來說是低脂肪和強化微量元素
- 能量棒中的碳水化合物濃度高於運動飲品，在練習前、中、後提供一定份量的能量
- 長時間的運動（例如：公路單車、鐵人），固體食物比較能滿足運動員的飢餓感
- 這是方便攜帶的小食，能提供適量的重要營養素及微量元素
- 某些產品不適合運動期間使用，特別是一些纖維質含量較高的產品
- 提供多款口味

## Concerns Associated with Use

- Balanced nutrition supplements when use in place of a meal, generally do not result in overall weight gain. Athletes aiming to increase lean mass or body weight should take these in addition to regular meals.
- Compact formula may lead to over-consumption of energy intake and unwanted weight gain in some athletes.
- Failure to follow the instructions for drink preparation may produce a drink that does not achieve the energy and nutrient content needed for a specific dietary goal. Over-concentration may lead to gastrointestinal discomfort.
- Lactose-free product should be chosen where athlete is lactose intolerant or following gastrointestinal upset.
- Check best before date before consumption.

**Example:** Enercal Plus, Ensure

## Energy Bars

### Overview

- Composition: Good source of energy, carbohydrate and protein.
- Generally low in fat and fortified with micronutrients.
- Energy bars are more concentrated form of carbohydrate than sports drinks and provide more energy when consumed before, during or after exercise.
- Solid food is more useful in satisfying hunger during endurance exercise (e.g. road cycling, ironman).
- Convenient snack with suitable proportion of macronutrients and a good source of micronutrients.
- Some products may not be suitable for use during exercise, especially those with higher fiber content.
- Comes in a variety of flavors.

## 簡介

- 能量棒這固體食物含濃縮的能量、碳水化合物、蛋白質和微量元素
  - ◆ 這些固體食物能提供能量、碳水化合物及飽足感，所以特別適合長時間的訓練中使用
  - ◆ 對於高能量需求的運動員可作為能量的補充品
  - ◆ 提供碳水化合物，蛋白質，脂肪和微量元素，作為運動後復原的補充品
  - ◆ 可於賽事與賽事間進食，例如：羽毛球、劍術、壁球、游泳、田徑和網球等
  - ◆ 當運動員在食物衛生不可靠的地方或找不到適合的食物時，可作為賽前食用，例如清晨進行三項鐵人賽事
- 濃縮且低纖維的碳水化合物
  - ◆ 適合比賽期間易有腸胃不適的運動員於賽前食用，因為這產品易於消化吸收
  - ◆ 適合過磅後的運動員食用以提供容易消化的碳水化合物作為能量補充（例如：輕量級賽艇運動員）
- 方便及衛生的小食並能提供能量、碳水化合物、蛋白質、脂肪及微量元素
  - ◆ 適合要外遊及生活繁忙的運動員食用

## 營養分析

	PowerBar Performance Bar	Harvest Bar	Clif Bar
份量	65克	65克	68克
能量 (千卡)	230	250	240
蛋白質 (克)	10	7	10
脂肪 (克)	2	5	5
飽和脂肪 (克)	0.5	2	1
膽固醇 (毫克)	0	0	0
碳水化合物			
總和 (克)	45	45	42
糖份 (克)	18	20	20
纖維 (克)	3	3	5

## Profile

- Composition: Compact source of energy, carbohydrate, protein and micronutrients in a solid form.
  - ◆ Solid food that provides energy, carbohydrate and satiety, therefore is especially useful in prolonged training sessions.
  - ◆ Supplement for athletes with high energy demands.
  - ◆ Post-exercise recovery supplement supplying carbohydrate, some protein, fat and micronutrients.
  - ◆ Supplement for use between events, e.g. badminton, fencing, squash, swimming, athletics, tennis etc.
  - ◆ Pre-exercise food for athletes competing in places where food hygiene is not dependable or not accessible, e.g. early morning triathlon race.
- Compact, low-fiber source of carbohydrate.
  - ◆ Useful as pre-event meal for athletes at high risk of gastrointestinal problems during exercise, because product is easy to digest and absorb.
  - ◆ Useful for athletes after weigh-in providing an easily digestible carbohydrate for energy replenishment (e.g. lightweight rowers).
- Convenient and hygienic snack providing energy, carbohydrate, protein, fat and micronutrients.
  - ◆ Useful for the athletes with busy schedule and traveling.

## Nutritional Analysis

	PowerBar Performance Bar	Harvest Bar	Clif Bar
Serving Size	65g bar	65g bar	68g bar
Energy (kcal)	230	250	240
Protein (g)	10	7	10
Fat (g)	2	5	5
Saturated Fat (g)	0.5	2	1
Cholesterol (mg)	0	0	0
Carbohydrate			
Total (g)	45	45	42
Sugars (g)	18	20	20
Fiber (g)	3	3	5

## 營養分析

	PowerBar Performance Bar	Harvest Bar	Clif Bar
每天營養素參考值百分比			
維他命A (微克)	0%	0%	30%
維他命E (毫克)	100%	100%	100%
維他命B1 (毫克)	100%	50%	25%
維他命B2 (毫克)	100%	50%	15%
煙酸 (毫克)	100%	50%	15%
維他命B6 (毫克)	100%	50%	20%
維他命B12 (微克)	100%	50%	15%
葉酸 (微克)	100%	50%	20%
維他命 C (毫克)	100%	100%	100%
鈣 (毫克)	30%	15%	25%
鎂 (毫克)	35%	15%	25%
鐵 (毫克)	35%	15%	25%
鋅 (毫克)	35%	15%	20%
鈉 (毫克)	95	100	220
鉀 (毫克)	200	-	250
泛酸 (毫克)	100%	50%	20%
磷 (毫克)	35%	15%	20%
銅 (毫克)	35%	15%	15%
生物素 (微克)	100%	-	10%
鉻 (微克)	20%	-	10%

## 使用時注意

- 能量棒適用於長時間及低至中強度的運動；而高強度及時間短的運動並不適合使用
- 某些產品含較多纖維素故此較難消化，所以不適合在運動中使用 (例如：Harvest Bar，Muesli bar)
- 某些產品在炎熱的天氣，可能會變軟和黏
- 吃能量棒時應攝取水份
- 運動員應先在訓練時使用及評估其耐受性才可在比賽時使用
- 食用前留意產品有效日期

**產品示例：**PowerBar Performance Bar, Harvest Bar, Clif Bar

## Nutritional Analysis

	PowerBar Performance Bar	Harvest Bar	Clif Bar
Daily Value (%)			
Vitamin A ( $\mu$ g)	0%	0%	30%
Vitamin E (mg)	100%	100%	100%
Vitamin B1 (mg)	100%	50%	25%
Vitamin B2 (mg)	100%	50%	15%
Niacin (mg)	100%	50%	15%
Vitamin B6 (mg)	100%	50%	20%
Vitamin B12 ( $\mu$ g)	100%	50%	15%
Folic acid ( $\mu$ g)	100%	50%	20%
Vitamin C (mg)	100%	100%	100%
Calcium (mg)	30%	15%	25%
Magnesium (mg)	35%	15%	25%
Iron (mg)	35%	15%	25%
Zinc (mg)	35%	15%	20%
Sodium (mg)	95	100	220
Potassium (mg)	200	-	250
Pantothenic acid (mg)	100%	50%	20%
Phosphorus (mg)	35%	15%	20%
Copper (mg)	35%	15%	15%
Biotin ( $\mu$ g)	100%	-	10%
Chromium ( $\mu$ g)	20%	-	10%

## Concerns Associated with Use

- Bars are suitable for use during prolonged, low-moderate intensity exercise and should not be used during high intensity short duration exercise.
- Some bars products contain higher fiber that are more difficult to digest may not be suitable for use during exercise, (e.g. Harvest Bar, Muesli bar).
- Some products may become soft and sticky in warm temperature.
- Fluid should be taken when eating energy bars.
- Athletes should be encouraged to practice use and assess tolerance during training before using in the competition.
- Check best before date before consumption.

**Example:** PowerBar Performance Bar, Harvest Bar, Clif Bar

## 糖漿

### 概要

- 成份：高濃度碳水化合物（約90%能量源於碳水化合物），方便食用及消化的漿狀
- 比運動飲品提供更多的碳水化合物，加促能量補充
- 方便攜帶和使用，但相對會較其他傳統的小食品貴
- 提供多款口味

### 簡介

- 糖漿提供方便及高濃度易消化的碳水化合物
- 很多糖漿產品含其他的成份如：電解質。部份還含咖啡因和氨基酸，使用者應留意食物標籤內容

### 營養分析

	Power Gel*	Hammer Gel	Leppin Squeezy	GU Energy Gel
份量	41克包裝	36克包裝	45克包裝	32克包裝
能量 (千卡)	120	86	100	100
蛋白質 (克)	0	0	0	0
脂肪(克)	0	0	0	0
碳水化合物				
總和 (克)	28	22	25	25
糖份 (克)	5	2	0	3
鈉 (毫克)	50	18	120	40
鉀 (毫克)	40	-	40	35

\*某些味道含咖啡因成份 (25毫克)

### 使用時注意

- 由於含高濃度碳水化合物，可能會令腸胃不適，服食一包糖漿的同時應飲250毫升水份以促進吸收
- 運動員若需在比賽時使用糖漿，應先在訓練期間使用及評估其耐受性
- 有些糖漿含有其他成份如：電解質、氨基酸和咖啡因。運動員應留意食物標籤內容
- 食用前留意有效日期

**產品示例：**Power Gel, Hammer Gel, Leppin Squeezy, Gu Gel

## Carbohydrate Gels

### Overview

- Composition: Concentrated source of carbohydrate (usually over 90% of total energy from CHO) in easily consumed and quickly digested gel form.
- Substantially more concentrated in carbohydrate than sports drinks to provide an energy boost in one serving.
- Convenient to carry and consume, but relatively more expensive than conventional food.
- Comes in a variety of flavors.

### Profile

- Carbohydrate gels provide concentrated carbohydrate in a convenient and easily consumed form.
- Most gels also contain other compounds such as electrolytes, some contain caffeine and amino acids, users should check ingredient list for information.

### Nutritional Analysis

	Power Gel*	Hammer Gel	Leppin Squeezy	GU Energy Gel
Serving Size	41g pack	36g pack	45g pack	32g pack
Energy (kcal)	120	86	100	100
Protein (g)	0	0	0	0
Fat (g)	0	0	0	0
Carbohydrate				
Total (g)	28	22	25	25
Sugars (g)	5	2	0	3
Sodium (mg)	50	18	120	40
Potassium (mg)	40	-	40	35

\*Some flavors contain caffeine (25 mg).

### Concerns Associated with Use

- Gastrointestinal intolerance may occur due to concentrated carbohydrate load; therefore, each packet of gel must be ingested with 250ml water in order to promote faster absorption.
- Athletes should practice use of gels and assess tolerance in training sessions if they will use it in competition.
- Some gels contain other compounds such as electrolytes, amino acids and caffeine. Athletes should check the product's ingredient list and nutrition facts for this information.
- Check best before date before consumption.

**Example:** Power Gel, Hammer Gel, Leppin Squeezy, Gu Gel

## 運動飲品

### 概要

- 成份：含碳水化合物 (6-8%)、電解質 (例如：鈉和鉀) 及水份
- 碳水化合物源於麥芽糖糊精、果糖、葡萄糖等
- 適合於運動前、中、後使用
- 吸收速度和水相若
- 有不同口味的飲品和粉狀供選擇
- 在水份補充方面比水更有效
- 運動中使用可補充汗液所流失的元素

### 補充簡介

- 運動飲品能補充流失的水份、電解質及碳水化合物，所以是運動前、中、後理想的水份補充
- 運動飲品比水更能使身體保持水份，因為它能減少水份在小便流失
- 最佳吸收幅度在10-15℃
- 有助運動員
  - ◆ 參與耐力運動
  - ◆ 酷熱天氣下運動
  - ◆ 應付大量訓練
  - ◆ 比賽期間有腸胃不適的運動員，可於賽前飲用
  - ◆ 適合過磅後的運動員盡快飲用，因它能提供容易消化的碳水化合物作為能量和水份補充 (例如：輕量級賽艇運動員)

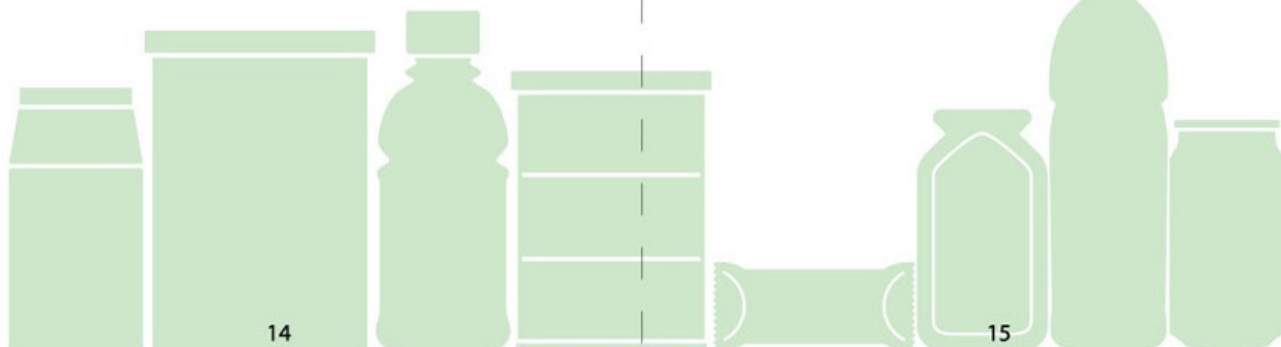
## Sports Drinks

### Overview

- Composition: Source of carbohydrate (6-8%), electrolytes (e.g. sodium and potassium) and fluid.
- Carbohydrate source is usually maltodextrin, fructose, glucose etc.
- Appropriate for use before, during and after exercise.
- Absorption is comparable to plain water.
- Usually comes in a variety of flavors in powder or liquid form.
- More effective in rehydration compared with plain water.
- Replaces sweat loss during exercise.

### Profile

- Ideal fluid for hydration before, during and after exercise, allowing the athletes to replace fluid, electrolytes, and carbohydrate all at once.
- Sports drinks promote better fluid retention over plain water by reducing fluid loss through urination.
- Best absorbed between 10-15°C.
- Useful for athletes who
  - ◆ Engage in endurance exercise.
  - ◆ Exercise under hot environment.
  - ◆ Coping with heavy training load.
  - ◆ Useful as pre-event beverage for athletes at high risk of gastrointestinal problems during exercise.
  - ◆ Useful for athletes after weigh-in providing an easily digestible carbohydrate for energy and fluid replenishment (e.g. lightweight rowers).



## 營養分析

	寶礦力 水特	葡萄適 (運動裝)	佳得樂	沛意力	Cytomax Sports Drink
份量	240毫升	240毫升	240毫升	240毫升	240毫升
能量 (千卡)	57.6	67.2	50	76.8	51
碳水化合物 (克)	14.4	14.4	14	19.2	13.3
蛋白質 (克)	0	極少量	0	0	0
脂肪 (克)	0	0	0	0	0
鈉 (毫克)	115.9	115.2	110	60	56.1
鉀 (毫克)	46.8	21.6	30	33.6	30.6

## 使用時注意

- 過量攝取含有熱量的飲品，會妨礙體重控制
- 凍飲比較容易入口
- 運動中使用含鈉的運動飲品可補充流失的鈉質及在長時間運動中預防低血鈉症
- 運動中脫水較容易導致腸胃不適，所以運動員應盡早補液來預防脫水
- 在訓期間熟習補液有助克服與補液相關的問題，如對於運動飲品口味的喜惡、吸收或腸胃不適 (例如：胃抽筋)
- 飲用前留意產品有效日期

**產品示例：**保礦力水特、佳得樂、葡萄適 (運動裝)、沛意力、Cytomax

## Nutritional Analysis

	Pocari Sweat	Lucozade Sport	Gatorade	Powerade	Cytomax Sports Drink
Serving Size	240 ml	240 ml	240 ml	240 ml	240 ml
Energy (kcal)	57.6	67.2	50	76.8	51
Carbohydrate (g)	14.4	14.4	14	19.2	13.3
Protein (g)	0	Trace	0	0	0
Fat (g)	0	0	0	0	0
Sodium (mg)	115.9	115.2	110	60	56.1
Potassium (mg)	46.8	21.6	30	33.6	30.6

## Concerns Associated with Use

- Overuse of energy-containing fluids may hinder weight control.
- Cool fluids are more palatable.
- Consumption of sodium containing sports drinks during exercise is useful in replacing excessive sodium losses and preventing hyponatremia in prolonged exercise.
- Dehydration increases the risk of gastrointestinal problems during exercise. Athletes need to drink earlier to prevent dehydration.
- Practicing fluid intake strategies in training session can help to overcome problems such as dislike of the taste, delayed gastric emptying or gastrointestinal discomfort (e.g. stomach cramps) associated with use of sports drinks.
- Check best before date before consumption.

**Example:** Pocari Sweat, Gatorade, Lucozade Sport, Powerade, Cytomax

### 概要

- 肌酸是由肝及腎製造。進入血管後會被肌肉細胞吸收
- 肌酸亦可在肉及魚中找到
- 素食者身體的貯備可能較低而形成對補充的效益較非素食者為高
- 肌酸可增加瘦肌肉重量及力量
- 肌酸可以幫助：
  - 1) 進行力量訓練的運動員增加瘦組織
  - 2) 需要重覆最高強度爆發力及只有短時間恢復的區間衝刺訓練
  - 3) 有間歇性衝刺特質的運動 (例如：足球，籃球，壁球，羽毛球等)
- 磷酸肌酸系統是10秒之內爆發力，重覆性高強度運動的重要能量來源

### 簡介

- 增加細胞的肌酸含量可能提高在恢復期磷肌胺酸的再造力，從而提供能量及減低由高強度訓練帶來的疲倦
- 肌酸可能可以提高肌漿球蛋白與蛋白質絲狀物的製造從而增加肌肉的體積
- 肌酸似乎可提升短途、高強度及有重覆性的運動
- 對較長的帶氧運動，肌酸就不能提升表現
- 有個別報告指抽筋及拉傷的機會上升，但這暫時並沒有研究數據支持
- 運動員應在監察下使用肌酸，並配合訓練計劃
- 快速裝載法：
  - ◆ 每天20克分4次服用，每次5克，為期5天
  - ◆ 肌酸應與甜而溫暖的液體混合服用。它並不能溶於液體，所以需立刻飲用
  - ◆ 注意在快速裝載期體重會上升0.6-1 公斤
  - ◆ 5天後是維持期，每天服2-3克便足夠

### Overview

- Creatine is produced by the liver and kidney. It is actively taken up by the muscle cells after release into the bloodstream.
- It is also found in meats and fish.
- Vegetarians are believed to have lower initial values of creatine and may respond to its supplementation more significantly than non-vegetarians.
- Creatine may increase lean body mass and strength.
- Creatine may be useful to:
  - 1) Athlete undertaking resistance training to increase lean body mass.
  - 2) Interval and sprint training sessions which require repeated short explosive maximal efforts with brief recovery intervals.
  - 3) Sports with intermittent work patterns (e.g. soccer, basketball, squash, badminton, etc.).
- The creatine phosphate system is the most important fuel source for sprints or bouts of high-intensity exercise lasting up to 10 seconds.

### Profile

- Increasing creatine content in muscle cell may increase the resynthesis of phosphocreatine during recovery which provides more energy and reduces the effect of fatigue resulting from high intensity training.
- Creatine may increase muscle size by increasing the rate of myosin heavy chain synthesis and the protein filament - actin.
- It MAY aid performance in short, maximal intensity exercise which requires repeated efforts.
- It does not improve performance in longer events which are predominantly aerobic.
- There are anecdotal reports of an increased risk of muscle cramps and strains, but studies to date do not support these reports.
- Athletes should take creatine under supervision as part of a well-organised program.
- Rapid Loading Protocol
  - ◆ 20g daily, divided into 4 doses, 5g per dose, for 5 days.
  - ◆ Creatine monohydrate is generally taken by dissolving the supplement in a sweetened, warm fluid. Since it does not dissolve in the fluid, consumption has to be immediate.
  - ◆ Weight gain of approximately 0.6-1.0 kg should be expected when using this protocol.
  - ◆ After 5 days, maintenance dose: 2-3g/day.

## 使用時注意

- 過量的肌酸會對肝臟與腎臟造成負擔，因它們需處理及排出肌酸。人類的肌肉可貯存肌酸的上限約是每公斤乾重150-160毫克分子
- 服用肌酸後可能產生以下的副作用：
  - ◆ 體重增加
- 對於力量與重量比率尤為重要的項目及有體重級別的項目可能造成負面影響
  - ◆ 較大機會有抽筋及脫水的問題
  - ◆ 肌肉拉緊、拉傷及崩緊
  - ◆ 腸胃不適：作悶、胃抽筋及肚瀉
- 長期服用的副作用仍是未知之素
- 運動員與教練員如欲使用肌酸應確定肌酸補充劑的質素及純度

## Concerns Associated with Use

- Excessive ingestion of creatine gives extra stress to the liver and kidneys to process and excrete it. Upper limit to the amount of creatine can be stored in the muscle appears to be 150-160mmol/kg dm.
- Consumption of creatine may induce the following side effects:
  - ◆ Weight gain
- May be counterproductive to athletes competing in sports where power-to-weight is a key factor in successful performance or sports involving weight divisions.
  - ◆ A greater incidence of muscle cramping and dehydration problems.
  - ◆ Muscle strains, muscle pulls and muscle tightness.
  - ◆ Gastrointestinal distress: nausea, stomach cramps, diarrhea.
- Potential side effects of long term use of the supplement are not known.
- Athletes and coaches who consider using creatine supplement should be sure of the quality and purity of the supplement.

## 總結

營養補充品可幫助運動員於不同情況下達到營養所需。它能幫助運動員達到能量要求，維持能量去應付練習或補充肌醣使運動後盡快復原。但是運動員必須考慮產品可能受污染的風險及於使用前衡量營養補充品的利弊。除此之外，營養補充品不能取替健康飲食，運動員應以健康飲食習慣為基礎來達到營養需求。

## Conclusion

Nutritional supplements may aid athletes in meeting their nutritional needs in various situations. They may help athletes to achieve energy requirement for weight gain, maintain energy level during exercise or replenish muscle glycogen quickly after exercise. However, athletes need to consider the risk of contamination in the products and weigh the benefits and concerns before use. In addition, nutritional supplements cannot replace a healthful diet and athletes should always strive to achieve sound eating habits as a foundation to achieving nutritional needs.

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